Final Report

AMPC
AUSTRALIAN MEAT PROCESSOR CORPORATION

MHA 3 Trial

Meat Hygiene Assessment 3 – An Industry Trial

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1.0 Executive Summary

The present report is the latest in a body of work broadly aimed at improving the ways in which the Australian meat industry monitors the microbiological and visual condition of its products. It began with a study in 2016 of *Process control monitoring - is there a better way?* (AMPC Project 2017-1068), which comprised four elements:

1. Analysis of *E. coli* and *Salmonella* Monitoring program (ESAM) and Product Hygiene Index (PHI) data
2. Analysis of Meat Hygiene Assessment (MHA) data
3. Development of a Compendium of Australian studies informing product monitoring
4. Workshops with industry and regulators to determine “Is there a better way?”.

Following critical analysis of the ESAM, PHI and MHA programs as operated by Australian meat export establishments, the scope of the PHI in terms of the number of Key Performance Indicators was reduced significantly.

In addition, the Export Meat Industry Advisory Committee (EMIAC) recommended the trialling of alternative monitoring procedures, to which end *Process monitoring for the Australian meat industry – a comparative trial* (AMPC 2018-1070) was undertaken. The trial involved twelve export establishments (six bovine, three ovine and three porcine) selected from every state of Australia based on their production volume and whether they boned hot or cold carcases. Over the period (October 2017 to October 2018), the project gathered a total of 27,157 microbiological results and 1,645,537 visual checks. These data were analysed and discussed with a Reference Panel comprising representatives of the Department of Agriculture, Water and the Environment (DAWE), industry, AMPC, Meat and Livestock Australia (MLA) and Australian Pork Limited (APL).

Regarding microbiological monitoring of meat and meat products, the Panel proposed radical changes: a single set of criteria for all species; reduced monitoring frequency for carcases; extending monitoring to meat products (bulk meat, primals and offal) together with performance criteria for each product type, and removal of *Salmonella* testing. The Department prepared specific submissions for the proposed microbiological monitoring to regulatory jurisdictions in the USA, UK and EU.

Regarding visual hygiene monitoring, it was concluded that: establishments already undertook a huge amount of visual checking of carcases, bulk meat and offals. The number of checks varied widely between establishments and was not directly related to the volume of production; overall, limits set for visual hygiene performance were breached very infrequently.

However, despite numerous meetings between industry representatives and the project Reference Panel, no consensus could be reached on what might comprise an alternative system for visual monitoring and it was recommended that a comprehensive review be undertaken of the current MHA requirements.

The review *Visual monitoring of carcases and carton meats – a system for the 21st century* (AMPC Project 2019-1066) interrogated data from the previous project (AMPC 2018-1070) – more than 1.6 million data points from carcases, bulk meat, primals and offal. Analysis of the data, coupled with extensive industry consultation, assisted in the development of three position papers:

1. Options for a visual monitoring system
2. What other countries do
3. The evolution of the Australian visual monitoring.

These background papers informed an iterative process, involving industry and the DAWE to develop *Meat Hygiene Assessment: Product Monitoring* (3rd edition), which became known as MHA 3, together with a Principles and Guidance document that underpinned its rationale and statistical basis. MHA 3 focused on food safety (Zero Tolerance (ZT), pathology and contamination-related defects); removed non-food safety (Minor and Manufacturing) defects; retained pre-boning room inspection checks; retained ZTs and pathology as per current definition and ascribed risk-based ratings to individual products.

To test the utility of the MHA 3 system, industry and DAWE recommended a trial involving the establishments which had generated more than 1.6 million visual checks in AMPC Project 2018-1070. While the Covid pandemic resulted in a delayed start and an alteration to participating establishments in *Meat Hygiene Assessment 3 – An industry trial* (AMPC Project 2021.1091), eleven establishments participated in what proved to be a successful trial, the outcomes of which form the bulk of this report.

Each participating establishment used a trial protocol (Meat Hygiene Assessment trial: How-to protocol for QA staff) to develop an Approved Arrangement (AA) for their MHA 3 system which, critically, divided carton meat and offal types into low- and high-risk categories, which had different sampling frequencies. Each AA was approved by DAWE and establishments reported visual monitoring results to SARDI who prepared regular updates for the Reference Panel.

The trial ran over the period April-November 2021 with each establishment reporting at least 100 days monitoring of the MHA 3 system. In total, product was monitored on 673,624 occasions, with great variation in the extent of monitoring between establishments depending on:

- Production volume (varied from 400-1700 head/day),
- Lot definition (varied from between work breaks to an entire shift),
- The establishment's definition of low- and high-risk products,
- Customer requirements, which were particularly onerous for three establishments, and
- Whether the establishment was responding to a Port of Entry investigation.

The design of the MHA 3 system allows the establishment to review the passage of defects along the continuum of slaughter floor, pre-trim, boning and offal rooms, and also to monitor the low/high-risk status of carton and offal meats. There were occasions when the establishment undertook Corrective Action due either to ZTs or to exceeding limits at the carcase, pre-trim, CMA or offal stage.

DAWE supplied verification data from April 2020-November 2021 using the MHA 2 system which allowed a comparison with defect ratings incurred by each establishment for 12 months prior to the trial, and during the trial itself. In almost all cases, there was no obvious difference between process control between the two phases. An exception was sheep carcases monitored on the slaughter floor at one establishment, where a reduction in chain speed and installation of a pre-evisceration wash appear to have reduced defect scores during the trial. In addition, on average, there were no statistically significant differences between pre- and during-trial MHA daily scores for carcases on the slaughter floor,

at pre-trim and on offal and all verification results fell well below the MHA 2 marginal limit for carcases on the slaughter floor, at pre-trim and on offal.

The MHA 3 system was considered more “fit for purpose” than MHA 2 with all eleven trial establishments proposing to continue their AA. Other establishments have indicated their intention to modify their AA to adopt MHA 3 and the Reference Panel recommended DAWE provide instructions and criteria for intending establishments, noting that AMPC have offered to provide resources to expedite the uptake of MHA 3. Establishments have been canvassed regarding any financial advantages which stem from adopting MHA 3. To date, one establishment calculates a saving of 2 person hours/shift, equating to $130 per shift, while indicating, together with several other establishments, that the time “saved” is being reinvested so QC/QA staff can proactively monitor potential trends, undertake investigations to improve the system and better interact with other departments.

2.0 Introduction

The Meat Hygiene Assessment (MHA) system has been implemented to assist the Australian meat industry to establish systems that monitor the food production process with regard to its ability to produce wholesome product. After its inception in 1996, MHA was revised in 2002 (AQIS, 2002) to give a second version for both process and product monitoring and over time, has been expanded and is considered to be cumbersome and onerous in terms of resources and costs.

AMPC 2018-1070 *Process monitoring for the Australian meat industry – a comparative industry trial* collected a total of 1,645,537 data points on visual monitoring checks of carcases, bulk meat, primals and offal and the information gathered indicated overall good performance with the Australian requirements. Feedback from industry representatives indicated a genuine desire to revise the current visual inspection model and there was a particular need for a more risk-based system, that is, a system that focusses more on checking of product that is more likely to be visually contaminated and less on cleaner product.

Under AMPC 2019-1066 *Visual monitoring of carcase and carton meats – a system for the 21st century*, the SARDI research team worked with industry and the Department of Agriculture, Water and the Environment (DAWE) to design a Meat Hygiene Assessment 3 (MHA 3) guideline for product monitoring. The data set on visual monitoring checks of carcases, bulk meat, primals and offal from AMPC 2018-1070 was analysed and used to develop MHA 3, of which key aspects are:

- A focus on food safety, based on Zero Tolerance (ZT), pathology and contamination-related defects.
- The elimination of non-food safety (minor and manufacturing) defects.
- Retention of pre-boning room inspection checks.
- Retention of ZTs and pathology as per current definition.
- Ascription of risk-based ratings to individual products.

The new system gained in principle agreement from industry and DAWE, subject to it being trialled in establishments. This leads to this current project – an industry trial of MHA 3.

3.0 Project Objectives

The project objective is to organise and deliver an industry trial to collect industry data on MHA 3 to assess its performance and cost effectiveness.

4.0 Methodology

4.1 Participating Establishments

Eleven establishments (six beef, two sheep and lamb, three pork) participated in this industry trial.

- JBS Foods Australia, Dinmore (beef)
- Teys Australia, Beenleigh and Tamworth (beef)
- The Casino Food Co-op, Casino (beef)
- HW Greenham and Sons, Smithton and Gippsland (beef)
- Fletcher International Exports, Albany (sheep)
- Australian Lamb Co, Colac (sheep)
- Big River Pork, Murray Bridge (pork)
- Seven Point Pork, Port Wakefield (pork)
- The Casino Food Co-op, Booyong (pork)

Eight of the eleven establishments participated in the industry trial of AMPC 2018-1070 and three other establishments were recruited, two beef and one sheep. Another sheep abattoir was approached and initially gave agreement to participate in the trial, but unforeseen on-plant circumstances delayed indefinitely the start of the trial at this establishment and as a result, it was decided that this establishment would be removed from the trial.

4.2 Plant Visits and Discussions

In March 2021, the SARDI team conducted training and advice sessions with each of the eleven establishments, either on-site (where COVID travel restrictions permitted) or via online teleconference (due to COVID travel restrictions). Establishments were encouraged to invite DAWE staff to participate in these meetings, an opportunity taken up at several establishments. These visits provided an opportunity for plant staff to discuss and clarify the MHA 3 system and to assist them in ascribing a risk-based rating (low/high) to their carton meat and offal products.

Two project updates were held with the participating establishments via Microsoft Teams; in August 2021, an update on the visual hygiene monitoring status of each individual establishment and the cohort in general under MHA 3, and in November 2021, each establishment received a presentation of their final results. At both meetings, the establishments were asked for any feedback on the MHA 3 system and would they wish to continue with MHA 3 post the completion of the trial.

4.3 Trial Protocol

The two key documents from AMPC 2019-1066 (Meat Hygiene Assessment: Product Monitoring (3rd edition) and Meat Hygiene Assessment (3rd edition): Principles and Guidance) were combined in the form of a trial protocol (Meat Hygiene Assessment trial: How-to protocol for QA staff). The trial protocol was used as the basis for each establishment's Approved Arrangement for the trial.

The trial protocol was reviewed by the Reference Panel, DAWE staff and staff from the participating establishments and as a result, changes were made based on the feedback and an updated protocol is included in Appendix 1.

4.4 Risk-based Sampling Regime / Risk Rating of Products

As part of MHA 3, establishments assigned carton meat and offal product types to high- and low-risk categories. To assist in the risk rating, SARDI analysed the MHA 2 results from the previous trial's data for the continuing establishments and the last six months' data (September 2020 – February 2021), for the three 'new' establishments. Summaries of the number of defects in the proposed defect categories under MHA 3 for the different product types (carton meat and offal) as well as in-house knowledge of recent customer complaints and other background information, including recent establishment-held offal MHA and CMA data, were used by operational and quality assurance staff to categorise CMA and offal products into high- and low-risk.

Each establishment developed a stand-alone Approved Arrangement for the trial, which included the product risk assessment, and these were approved by Jason Ollington, DAWE, before the trial began with a shakedown phase in May 2021.

4.5 Collection and Reporting of Establishment MHA 3 Data

Establishments submitted MHA 3 data to SARDI regularly (daily/weekly), with the exception of two beef establishments which decided to continue with the MHA 2 system and manipulate the reporting to conform with the MHA 3 system. The commencement of the trial varied between establishments, due to operational and logistic implementation and interpretation. The research team and Reference Panel decided that due to the varying start dates, instead of a running the trial for six months, the trial would run for at least 100 days of reporting at each establishment and the final date of data reporting was the 12th of November 2021.

An Excel spreadsheet was used for data entry of all data collected as part of this project, adapted from the spreadsheet used in AMPC 2018.1070 and one for each establishment/species. The spreadsheet contains separate data entry sheets for carcase, pre-trim boning room, carton meat (high- and low-risk products) and offal (high- and low-risk products) MHA. Reporting of data to SARDI included Excel spreadsheets, pdf files or iLeader reports.

4.6 DAWE Verification Data

It was agreed that during the MHA 3 trial, DAWE on-plant staff would continue to verify product monitoring under MHA 2 criteria. SARDI received MHA 2 verification data (number of checks, ZTs, daily MHA score) on carcase, boning room and offal checks from April 2020 to April 2021 to represent the 'before trial' baseline and from May to November 2021

to represent the trial. The 'before trial' and 'during trial' verification data were compared to assess whether there had been a change since the commencement of the MHA 3 trial.

4.7 Reference Panel

As with the previous two projects (AMPC 2018-1070 and AMPC 2019-1066), a Reference Panel of industry stakeholders and DAWE was established to provide oversight of the project as well as disseminate information to stakeholders.

The Reference Panel members were:

- Michael Johnston (JBS Australia)
- John Langbridge (Teys Australia)
- Wille Rijnbeek (HW Greenham and Sons Pty Ltd)
- Trevor Moore (The Casino Food Co-op)
- Stewart Lowden (DAWE)
- Jason Ollington (DAWE)
- Mark Salter (DAWE)
- Matthew O'Bryan (AMPC)
- Andreas Kiermeier (Statistical Process Improvement Consulting and Training Pty Ltd)
- John Sumner (M&S Food Consultants Pty Ltd)
- Jessica Jolley (SARDI)

The Reference Panel met three times via teleconference (1st of March 2021, 16th of July 2021 and 8th of December 2021) and at each meeting, an update on the progress of the trial and the trial results were presented and discussed.

4.8 Export Meat Industry Advisory Committee (EMIAC) Food Safety and Animal Health Subcommittee

An agenda paper on trial results to date was tabled and discussed at Meeting 27 on the 18th of October 2021 and it is planned that a presentation by SARDI will be given at the next EMIAC Food Safety and Animal Health Subcommittee meeting in February/March 2022.

4.9 Statistical Analysis

All statistical analyses were performed using the software program R (version 3.6.1, 2019). Analysis of variance was used to assess whether there was a statistically significant difference between pre-trial and during trial DAWE verification data on daily MHA scores.

5 Project Outcomes and Discussion

5.1 Establishment MHA 3 Trial Data

Over the period May-November 2021, eleven establishments monitored the visual condition of carcases and product using the MHA 3 system on at least 100 production days. In total, product was monitored on 673,624 occasions (Table 1). There was great variation in the extent of monitoring between establishments depending on:

- Production volume (varied from 400-1700 head/day),
- Lot definition (varied between work breaks to an entire shift),
- Definition of high- and low-risk products,
- Customer requirements, which were particularly onerous for establishments D, E and H, and
- Whether the establishment was responding to a Port of Entry investigation.

Table 1: Summary data for monitoring under the MHA 3 system.

Plant	Species	Carcases	Pre-trim	High-risk CMA	Low-risk CMA	High-risk offal	Low-risk offal	Total
A	Beef	5,283	4,870	1,187	1,169	9,549	2,712	24,770
B	Beef	4,288	4,020	4,662	1,205	10,332	2,695	27,202
C	Beef	6,100	7,410	3,156	1,664	10,164	1,462	29,956
D	Beef	18,388	19,840	3,347	8,065	26,550	85,570	161,760
E	Beef	8,774	8,950	10,774	29,851	9,260	33,020	100,629
F	Beef	6,626	2,852	1,887	1,034	8,466	1,484	22,349
G	Sheep	18,400	7,648	9,083	4,143	6,576	4,392	50,242
H	Sheep	78,579	10,034	5,854	2,834	69,912	10,212	177,425
J	Pigs	20,613	3,803	1,182	1,108	-*	1,596	28,302
K	Pigs	6,350	3,860	6,636	1,213	10,244	5,152	33,455
L	Pigs	5,492	3,190	1,540	851	5,176	1,285	17,534
	Total	178,893	76,477	49,308	53,137	166,229	149,580	673,624

*All products were considered low-risk.

In Tables 2-4 are summarised the outcomes of monitoring at various stages on the slaughter floor and in the boning and offal rooms. At each stage, a ZT automatically triggered corrective action as set out in the establishment's Approved Arrangement. Corrective action was also triggered when limits for other visual defect criteria were exceeded and such exceedances are in addition to ZTs. A full accounting of defects at each establishment and each monitoring stage is presented in Appendix 2 and key observations are made in the following text.

As indicated in Table 2, Establishment L had 91 exceedances at pre-trim due predominantly to hair strands and clusters.

Table 2: Zero Tolerance and Limit exceeded on carcases and at pre-trim under the MHA 3 system.

Plant		Carcases			Pre-trim		
		n	ZT	Limit exceeded	n	ZT	Limit exceeded
A	Beef	5,283	1	0	4,870	2	1
B	Beef	4,288	0	0	4,020	0	0
C	Beef	6,100	1	0	7,410	0	5
D	Beef	18,388	4	0	19,840	2	1
E	Beef	8,774	0	2	8,950	0	4
F	Beef	6,626	2	0	2,852	2	2
G	Sheep	18,400	7	1	7,648	1	0
H	Sheep	78,579	1	0	10,034	2	0
J	Pigs	20,613	0	0	3,803	0	2
K	Pigs	6,350	6	0	3,860	3	4
L	Pigs	5,492	0	2	3,190	0	91

Establishment C exceeded limits on five occasions at pre-trim and 84 and nine occasions when monitoring high-risk and low-risk CMA product, respectively (Table 3). Limits were exceeded almost entirely by high prevalence of rail dust, a situation which persisted throughout the trial, the underlying cause thought to be due to engineering changes, extensive excavations and construction.

Also as seen in Table 3, Establishment L exceeded limits on high-risk CMA products on 50 occasions due predominantly to hair strands and clusters. Establishment G had ZTs (22) and seven exceedances on high-risk CMA products and responded by slowing chain speed by 30% and installing a pre-evisceration wash. At Establishment H, limits were exceeded on low-risk CMA products on eleven occasions prompting a re-evaluation of low- and high-risk product categorisation.

Table 3: Zero Tolerance and Limit exceeded on high- and low-risk CMA under the MHA 3 system.

Plant		High-risk CMA			Low-risk CMA		
		n	ZT	Limit exceeded	n	ZT	Limit exceeded
A	Beef	1,187	0	0	1,169	0	0
B	Beef	4,662	1	0	1,205	0	0
C	Beef	3,156	2	84	1,664	0	9
D	Beef	3,347	0	0	8,065	0	0
E	Beef	6,670	0	0	18,887	0	0
F	Beef	1,887	0	0	1,034	0	0
G	Sheep	9,083	22	7	4,143	0	0
H	Sheep	5,854	0	3	2,834	0	11
J	Pigs	1,182	0	1	1,108	0	2
K	Pigs	6,636	1	7	1,213	0	1
L	Pigs	1,540	0	50	851	0	1

As shown in Table 4, the limits for high-risk offal at Establishments D and K were exceeded on 12 and 13 occasions, respectively, predominantly for hair strands (Establishment D) and for hair strands and clusters (Establishment K).

During debriefing at the end of the trial establishments indicated their satisfaction with MHA 3 system and plant staff were unanimous about their desire to continue with their Approved Arrangement. In particular, staff indicated that:

- Carcase (slaughter flood and boning room) took about the same amount of time, while offal and CMA checks took less time (depending on the number of high-risk products);
- The results (i.e. detection of defects) were more informative to problems that needed attention;
- The modified corrective actions provided more immediate opportunity to follow-up on the floor, which in turn, allowed staff more control over their department to implement corrective / preventative action.

Table 4: Zero Tolerance and Limit exceeded on high- and low-risk offal under the MHA 3 system.

Plant		High-risk offal			Low-risk offal		
		n	ZT	Limit exceeded	n	ZT	Limit exceeded
A	Beef	9,549	0	2	2,712	0	0
B	Beef	10,332	1	0	2,695	0	0
C	Beef	10,164	0	0	1,462	0	0
D	Beef	26,550	2	*12	85,570	2	0
E	Beef	9,260	0	*2	33,020	0	0
F	Beef	8,466	9	1	1,484	4	0
G	Sheep	6,576	0	1	4,392	0	0
H	Sheep	69,912	0	0	10,212	0	0
J	Pigs	-	-	-	1,596	0	0
K	Pigs	10,244	1	2	5,152	0	0
L	Pigs	5,176	0	13	1,285	2	6

*partially simulated from MHA 2 data

5.2 DAWE Verification Data

Verification data obtained from DAWE staff from April 2020 to November 2021 using MHA 2 criteria provided a pre-trial:trial continuum where vertical lines indicate when the trial began at each establishment and gaps in data indicate plant shutdowns. Verification data were available for carcases monitored on the slaughter floor and at pre-trim, and for offal.

In almost all cases, Figures 1-3 indicate no obvious difference between process control, as measured by MHA 2 criteria over the period April 2020 - November 2021, the last six months of which was the trial period. An exception was sheep carcases monitored on the slaughter floor at Establishment G, where a reduction in chain speed and installation of a pre-evisceration wash appear to have reduced the MHA 2 scores during the trial.

As indicated in Table 5, there were no statistically significant differences between pre- and during-trial MHA daily scores for carcases on the slaughter floor, at pre-trim and on offal, on average. As well, all verification results fell well below the MHA 2 marginal limit for carcases on the slaughter floor, at pre-trim and on offal.

Table 5: Average MHA 2 DAWE verification data daily scores pre-trial (April 2020 – April 2021) and during trial (May 2021 – November 2021).

	Carcase MHA Daily Score		BR MHA Daily Score		Offal MHA Daily Score	
Plant	Pre-trial	During trial	Pre-trial	During trial	Pre-trial	During trial
A	0.22	0.27	0.03	0.05	0.03	0.06
B	0.08	0.09	0.03	0.01	0.02	0.01
C	0.26	0.19	0.39	0.36	0.03	0.02
D	0.32	0.32	0.09	0.05	0.10	0.10
E	0.67	0.58	0.15	0.11	0.08	0.08
F	0.19	0.24	0.19	0.15	0.05	0.09
G	1.26	0.36	0.00	0.00	0.04	0.01
H	0.46	0.69	0.00	0.00	0.01	0.00
J	0.21	0.31	0.09	0.09	0.03	0.05
K	0.41	0.49	0.15	0.14	0.04	0.04
L	0.44	0.49	0.10	0.14	0.04	0.07

Figure 1: DAWE verification data for carcases on the slaughter floor (vertical lines indicate when the trial began at each establishment and gaps in data indicate plant shutdowns).

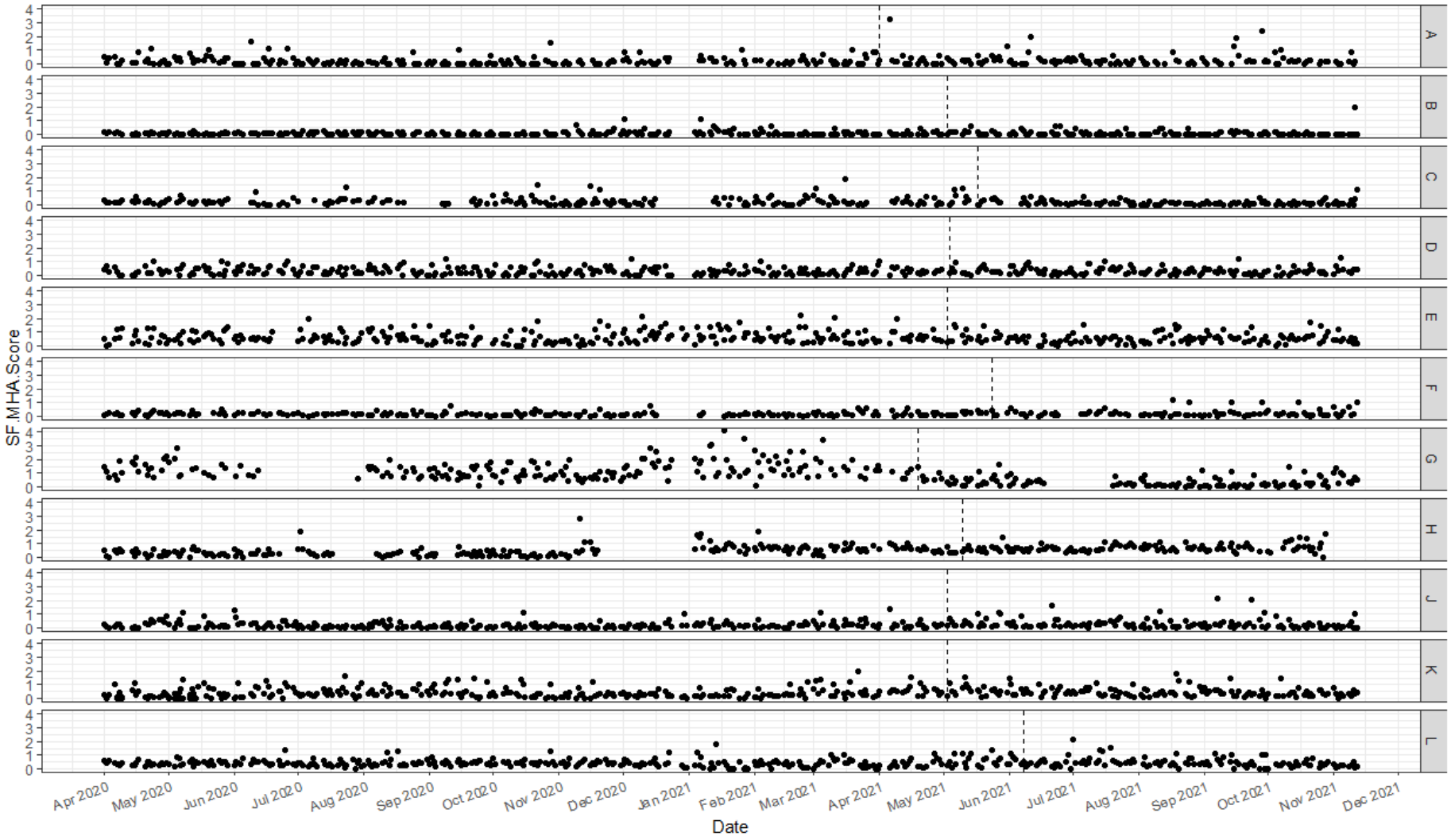


Figure 2: DAWE verification data at pre-trim (vertical lines indicate when the trial began at each establishment and gaps in data indicate plant shutdowns).

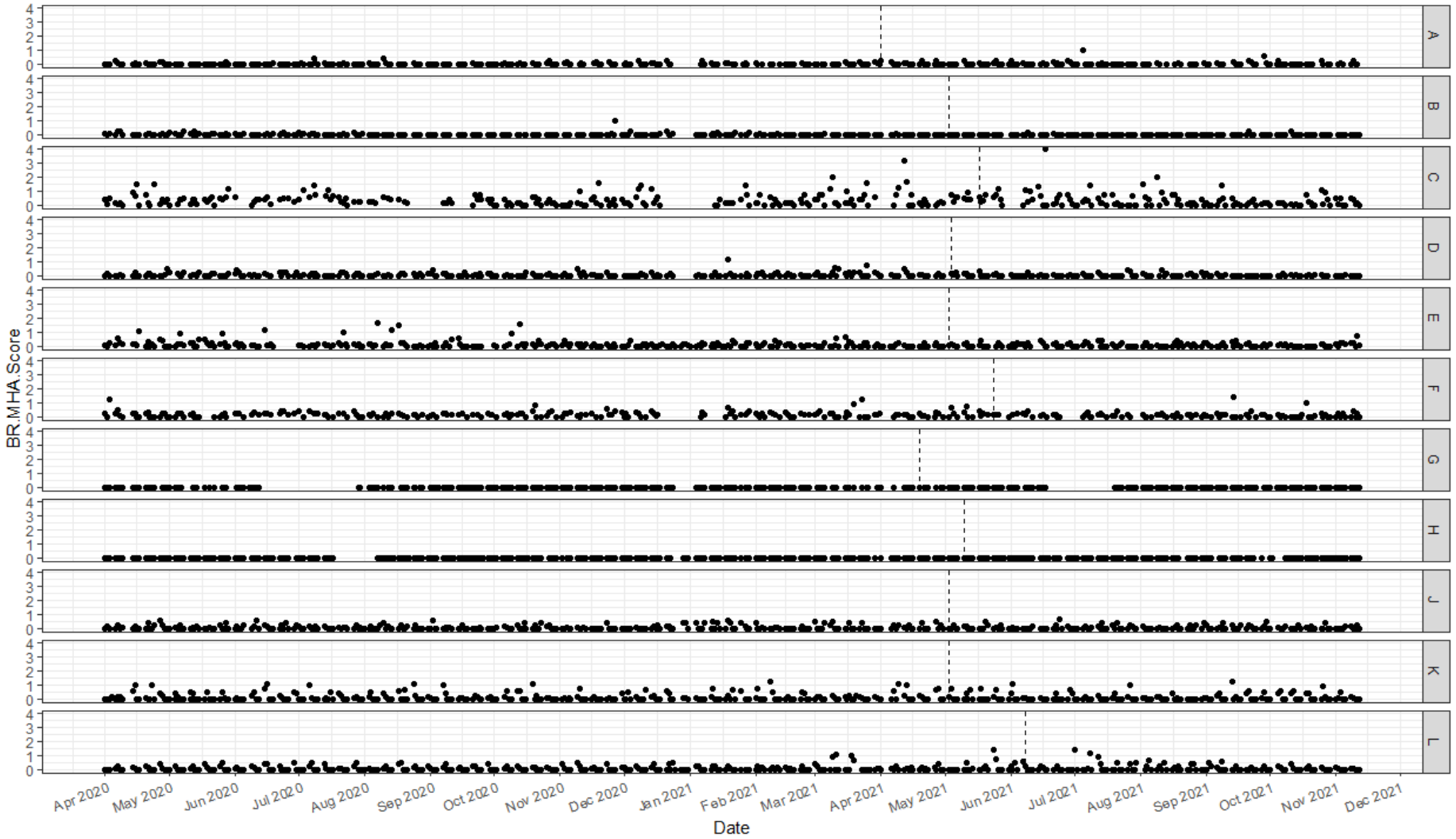
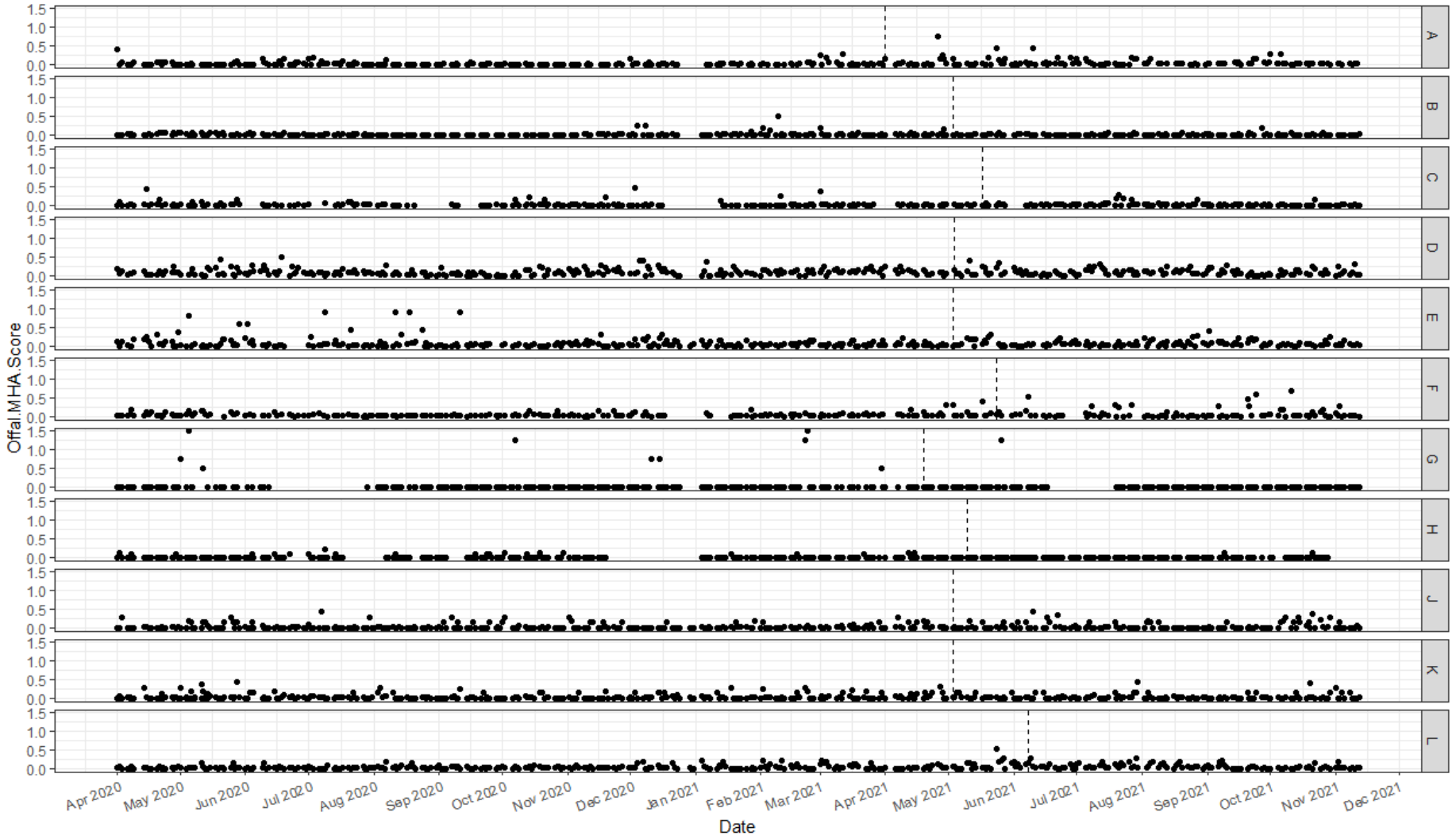


Figure 3: DAWE verification data for offal (vertical lines indicate when the trial began at each establishment and gaps in data indicate plant shutdowns).



5.3 Cost Implications

During the final plant meetings, there was unanimous agreement by plant staff that MHA 3 was less time-consuming but produced more targeted and actionable data. The time-savings allowed QC/QA staff to proactively monitor potential trends, undertake investigations to improve the system and interact with other departments (for example, the slaughter floor). There was no indication by any establishment of a desire to reduce the workforce. It should be noted that the extent of any cost savings is related to the number of high-risk CMA and offal products processed by an establishment as well as the definition of a lot, for example, whole day versus period between breaks.

Industry members of the Reference Panel were asked about quantifying the cost / labour savings resulting from the implementation of MHA 3 in their establishments. At the time of writing, only one response had been received which indicated that MHA 3 resulted in approximately 2 hours per shift at a cost of $65/hour. Assuming there are 250 work days/shifts per year, this equates to a potential saving of $32,500 per year for a single establishment.

6 Conclusions / Recommendations

The Reference Panel considered findings presented in Tables 1-5 and Figures 1-3, together with the intentions of all eleven establishments to continue with their Approved Arrangement based on MHA 3 monitoring. Members of the panel were also aware that companies which were not part of the trial group had expressed their interest to develop, in a timely manner, an Approved Arrangement based on MHA 3.

Accordingly, the Reference Panel:

1. Noted that MHA 3 still identified issues in visual hygiene monitoring as primarily illustrated by Plants C and L and in most cases, the classification into high- and low-risk CMA and offal products was appropriate and supported by the trial data.
2. Concluded that the trial had been successful and recommended that trial establishments continue with their Approved Arrangement based on MHA 3.
3. Recommended that the Department provide instructions and criteria for establishments wishing to develop an Approved Arrangement based on MHA 3.

To date, process monitoring undertaken by abattoirs as outlined in MHA 2 has not been reviewed and industry has identified the need for a similar comprehensive review as per product monitoring which resulted in *Meat Hygiene Assessment: Product Monitoring* (3rd edition). A recommendation is that the system for process monitoring be critically assessed.

7 Bibliography

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8 Appendices

8.1 Appendix 1: MHA 3 Trial Protocol

Meat Hygiene Assessment trial: How-to protocol for QA staff

MHA 3 – the new system under trial

MHA 2 contains two components – process and product monitoring. This revision of MHA includes changes to **product monitoring only** and process monitoring should continue as per MHA 2.

In addition, under product monitoring, the sample units (carcase, carcase half, etc.) and sampling areas and scanning lines are as per MHA 2.

The new system differs from the current in several important ways, in that, it:

1. Is risk-based – offering the opportunity for an establishment to identify those products that require more, or less monitoring.
2. Includes only Zero Tolerance (ZT) defects, pathology defects and contamination-related criteria that were previously considered to be Major or Critical defects as part of MHA 2. Does not include Minor defects in the defect rating since these were categorised as “Affects appearance; not food safety” in MHA 2.
3. Uses establishment data to ascribe a risk rating to their individual products to be monitored.

A summary of changes to carcase, carton meat and offal MHA are given in the below table.

Carcase	*No change from current system*	• Monitor frequency • ZT automatically rates the lot as unacceptable • Corrective action • Pre-boning inspection • Record ZTs and pathology
	Changes in MHA 3	• Remove reduced and intensified sampling frequency • Record Contamination defects • Calculate defect rating as number of defects/number of checks • Revised limit of acceptability is 0.25 – equivalent to current limit • No Marginal category
Carton meat	*No change from current system*	• Record ZTs and pathology • ZT automatically rates the lot as unacceptable

	Changes in MHA 3	• Each product classified as Low- or High-risk
		• Sample all product in the carton
		• Sample every 60 minutes:
		  ○ Every high-risk product
		  ○ Low-risk products on a rotational basis
		• Record Contamination defects
		• Acceptability criterion: No more than 1 defect from all sampled cartons per high-risk category or across all low-risk products in a shift

		• Corrective action: Re-inspect all available product type and, if one or more defects found (so not an isolated incident), proceed to defrost re-inspection
Offal	*No change from current system*	• Record ZTs and pathology • ZT automatically rates the lot as unacceptable
	Changes in MHA 3	• Each product classified as Low- or High-risk • Sample 12 pieces of offal • Record Contamination defects • Acceptability criterion: Defect rating of 0.084 • Corrective action: Re-inspect all available product type and, if one or more defects found (so not an isolated incident), proceed to re-inspection.

Examples, case studies and template forms are contained at the end of this document.

Meat Hygiene Assessment: Product Monitoring ("3rd edition")

AIMS

For all export establishments that handle unwrapped meat (i.e. abattoir, boning room) the objectives of MHA are to:

1. Confirm that each product type meets the outcomes defined by critical limits.
2. Describe corrective and preventive actions when monitoring indicates that critical limits have been exceeded.

Assessment Of Carcases, Sides and Quarters

Outcome

Each unit of product will leave the slaughter floor free of ZTs and food safety-relevant defects, a process that will be performed by operators trained in their removal.

The assessment of carcases/sides is done before they leave the slaughter floor and prior to the final carcase wash.

Sample Plan

The minimum number of samples required for a statistical assessment of product is dependent on the number of items processed (Table 1); these are based on Australian Standard AS 1199.1-2003, "Sampling Procedures and Tables for Inspection by Attributes".

Table 1: Sample Numbers

Number of animals in a lot	Sample size
1 - 25	5
26 – 50	8
51 - 90	13
91 - 280	20
281 – 500	32
> 500	50

Monitoring

1. A production lot is the number of animals over which a monitoring sequence is conducted. It may represent the entire production for a shift or any part thereof.
2. Selection of samples must be random and spread over every defined lot.
3. The entire lot represented by the sample is subject to any necessary corrective action.
4. Independent boning rooms will treat loads from different abattoirs as separate lots.
5. Facilities must be available and adequate to allow a thorough examination of all surfaces of product and to perform corrective action as necessary.
6. Lighting at the assessment point must be at least 600 lux.
7. Adequate time must be allocated to ensure a thorough examination of product.
8. Where a unit of product is divided into sections for assessment, all defects from each section must be added to determine the defect score for that unit.
9. Assessment must be performed in a consistent manner using a defined scanning method.

Classification of Carcase Defects

Defects are classified to reflect their effect on the safety and suitability (wholesomeness) of the product (Table 2).

Table 2: Classification of carcase contamination defects

Defect criterion	Detection of a likely food safety relevant defect	Zero Tolerance
Faeces, Milk, Ingesta		Any Amount[1]
Contamination		
- Urine	Any Amount	
- Rail Dust, Specks, Hide & Wool Dust	≥ 11	
- Smears & Stains (inc bile, oil & grease)	≥ 1 cm diameter	
- Hair & Wool Strands[2]	≥ 11	
- Hair & Wool Clusters, Hide, scurf, toenails[2]	≥ 2	
- Foreign objects	Hide ≥ 1 cm gross diameter (GD)	
	Any non-animal material	
Pathology[3]	Any	

1. Retained lactating udder fragments are evidence of milk contamination. Gut segments, including oesophagus, are classified with faeces, ingesta and milk.

For a defect to be rated as a zero tolerance defect it must be clearly identifiable to the naked eye as faeces, ingesta or milk.

2. Short attached shaved bristles on pigs and skin-on goats are exempt as hairs.

3. Abscesses are classified as pathology.

A **zero tolerance** detection on carcases selected for monitoring after the final trim, automatically rates the lot as unacceptable. The affected lot is subject to further investigation and corrective action as described in the section on Corrective Action. Corrective action must be verified after implementation to assess effectiveness of that action and records should be kept of that verification.

Recording

Carcase/sides assessment recording shall:

1. Record the assessment of samples in the appropriate columns on a recording sheet by inserting the result for multiple carcases/sides in each column. Other details such as the plant identifier; species; date and time of sample checking; name, position and signature of the person undertaking the check should also be recorded (Appendix 1).
2. Non-scoring defects for carcases and sides are not cumulative over the lot and must be trimmed and removed.

Calculation of Defect Rating

1. Any detection of a zero tolerance defect during sampling will automatically rate the lot as unacceptable. If a ZT has been detected, then no Defect Rating needs to be calculated.
2. Where no ZTs are detected, the total number of defects is divided by the number of samples to establish the Defect Rating.
3. The defect ratings determined on product before it leaves the slaughter floor are categorised as in Table 3.

Table 3: Defect rating limits for carcases/sides before they leave the slaughter floor.

Defect rating	Rating
≤ 0.25	Acceptable
> 0.25	Unacceptable

Corrective Action

1. Corrective action must address both immediate (for the affected lot) and the longer term preventive measures.
2. Immediate corrective action is required with unacceptable product and zero tolerance findings.
3. The work instruction for corrective action must be contained in the Approved Arrangement.

4. The corrective action must be recorded, the effectiveness of the action verified and the verification recorded.

Immediate Corrective Action

1. All defects shall be trimmed immediately.
2. Where zero tolerance is identified, part of the corrective action shall include a review and correction of the process controls and attention by slaughter floor trimmers to the problem area.
3. An additional trim on all related product (carcases/sides in the monitoring lot) in the failed lot will be undertaken. Where product is boned on the same establishment, intensify the pre-boning trim by placing special emphasis on identified problem areas, according to the established program agreed between the company and the Department.
4. The effectiveness of this trim must be verified by sampling and the results recorded.
5. Feedback is required to correct the cause of the defects and there must be a record of this.

MHA for Pre-Boning Room Inspection

1. Examine at least 10 carcases/sides per lot to assess the effectiveness of the trim using the same defect criteria in Table 2.
2. A production lot is the number of carcases/sides over which a monitoring sequence is conducted. It may represent the entire production for a shift or any part thereof.
3. Selection of samples must be random and spread over every defined lot.
4. The entire lot represented by the sample is subject to any necessary corrective action.
5. The total number of defects is divided by the number of samples to establish the Defect Rating.
6. An acceptable defect rating is ≤ 0.1.
7. Defects identified during inspection should be removed immediately.
8. A zero tolerance detection on carcases selected for monitoring after the pre-boning trim, automatically rates this lot as unacceptable. It also triggers immediate corrective action in the form of increased monitoring and adjustment of the operation.
9. The affected lot is subject to further investigation and corrective action as described in the above section on Corrective Action.

Assessment of Carton Meat

Outcome

Each carton of boneless manufacturing meat and bulk and layer packs will leave the boning room free of ZTs and food safety-relevant defects, a process that will be performed by operators trained in their removal.

Product Types to Monitor

1. Establishments need to categorise their product types into low- and high-risk categories according to the likelihood of finding contamination defects (see Table 4 for defect classifications).
2. A business will establish the High-risk category based on a number of criteria, including:
    a. Historical performance of their inspection results
    b. Market and customer requirements
    c. Customer complaints / advice
    d. Port of entry detections
    e. Knowledge about the type of product and degree of processing (for example, denuded products and those without external carcase surfaces might be considered low-risk)
3. All other products are classified as Low-risk.
4. A product's category may change, according to a number of factors that are outlined in point 2 (above). Establishments must be able to justify and provide supporting data and information.
5. This classification process will be verified by the Department and both Low- and High-risk products may be sampled as part of their verification process.

Sample Plan

1. One sample each will be drawn every 60 minutes of each product from the High-risk category and every 60 minutes from the Low-risk category as a group.
2. Sampling should only occur at set intervals during periods when the product is produced. That is, production breaks, including work breaks, should not be included in the calculation of the sampling interval.
3. Samples will consist of the whole carton and will be drawn following completion of carton packing.
4. For the Low-risk group, selection of cartons will cycle through the products in the Low-risk group.
5. Where combo bins are packed, the mass sampled and the intervals between sampling will be determined by the establishment. These should be at a comparable amount / frequency of product packed in cartons.
6. Lighting at the assessment point must be at least 600 lux.
7. Adequate time must be allocated to ensure a thorough examination of product.

Classification of Carton Meat Defects

Table 4: Classification of carton meat defects

	Detection of a likely food safety relevant defect	Zero Tolerance
Faeces, milk, ingesta		Any Amount
Contamination - Rail dust, specks, hide & wool dust - Stains, discoloured areas - Hair, wool, hide - Foreign objects	 ≥ 11 1× > 4cm GD or More than 5× 1-4 cm GD ≥ 11 strands Hide > 1cm diameter Any non-animal material	
Pathological lesions	Any lesion including inflamed seeds	

Criteria for defect classifications refer to totals recorded in a sample from one carton.

Determining Product Acceptability

1. Inspection data will be collected and recorded separately for each product in the High-risk category and for the Low-risk products as a group.
2. The product type sampled and the time of sample checking will be recorded.
3. For each sample, the number of defects must be recorded on the control form (Appendix 2 and 3) according to the defect classification above (Table 4).
4. Product is deemed acceptable if no ZTs are detected or no more than one defect is detected per product type or low-risk group in a shift.
5. A trained and competent establishment employee must be assigned as a boning room quality control inspector to conduct and record these inspections in real time.

Corrective Action

1. Corrective action must address both immediate (for the affected product) and the longer term preventive measures.
2. Immediate corrective action is required with unacceptable product.
3. The work instruction for corrective action must be contained in the Approved Arrangement.
4. The corrective action must be recorded, the effectiveness of the action must be verified and the verification recorded.

Immediate Corrective Action

1. All available meat in the room associated with the product type and restricted to specific products is to be re-inspected. Any defects identified are to be trimmed.
    - For Low-risk products, all contributing product types needs to be re-inspected.
2. If no defects according to the classification in Table 4 are found, no further action is required.
3. If one or more defects according to the classification in Table 4 are found, the offending product (back to the last clear check) is subjected to re-inspection.
    - Where possible, the samples for re-inspection shall be selected from cartons which have not entered the freezing process; frozen product will be thawed for re-inspection.
    - Randomly select 6 cartons and arrange for 5.5 kg samples to be removed, from each.
    - Assess the selected samples on the basis of the classification in Table 4.
    - Any unacceptable cartons must be re-worked/treated and re-inspected until all affected product is rendered acceptable and fit for human consumption.

Assessment of Offals

Outcome

Each container of offals will leave the offal packing room free of ZTs and food safety relevant defects, a process that will be performed by operators trained in their removal.

Offals (excluding green offals) are assessed following final processing.

Product Types to Monitor

1. Establishments will categorise their product types into Low- and High-risk categories according to the likelihood of finding contamination defects (see Table 5 for defect classifications).
2. A business will establish the High-risk category based on a number of criteria, including:
    a. Historical performance of their inspection results
    b. Market and customer requirements
    c. Customer complaints/advice
    d. Port of entry detections
    e. Knowledge about the type of product and degree of processing (for example, scalded offal might be considered low risk)
3. All other products are classified as Low-risk.
4. A product's category may change, according to a number of factors which are outlined in point 2 (above). Establishments must be able to justify and provide supporting data and information.
5. This classification process will be verified by the Department and both Low- and High-risk products may be randomly sampled as part of their verification process.

Sample Plan

1. For High-risk products, a sample size of 12 pieces of offal from each offal type will be selected at random and assessed for every lot. The aim should be to select samples on at least three different times during each lot.
2. For the Low-risk group, 12 offal pieces per lot will be drawn and assessed. Sampling should cycle through the products in the Low-risk group.
3. Lighting at the assessment point must be at least 600 lux.
4. Adequate time must be allocated to ensure a thorough examination of product.

Classification of Defects

Table 5: Classification of offal defects

	Detection of a likely food safety relevant defect	Zero Tolerance
Faeces, milk, ingesta		Any Amount[1]
Contamination - Smears & stains (inc bile, oil & grease) - Hair & Wool Strands - Hair & Wool Clusters - Foreign objects	 ≥ 1 cm (GD) ≥ 11 ≥ 2 Any non-animal material	
Pathology[2]	Any incidence	

[1] Gut segments, including oesophagus, are classified along with faeces, ingesta and milk.

[2] Urine retention cysts are considered pathology.

Calculation of Defect Rating

1. Inspection data will be collected and recorded separately for each product in the High-risk category and for the Low-risk products as a group.
2. The product type sampled and the time of sample checking will be recorded (see Appendix 4 and 5).
3. Any detection of a Zero Tolerance defect during sampling will automatically rate the lot as unacceptable. If a ZT has been detected, then no Defect Rating needs to be calculated.
4. Where no ZTs are detected, the total number of defects is divided by the number of samples to establish the Defect Rating.

5. The defect rating is categorised as in Table 6.

Table 6: Defect rating limits for offal from all species

Defect rating	Rating
< 0.084	Acceptable
≥ 0.084	Unacceptable

Corrective Action

1. Corrective action must address both immediate (for ZT affected product) and the longer term preventive measures for ZT affected product or a failed defect rating.
2. Immediate corrective action is required for unacceptable product.
3. The work instruction for corrective action must be contained in the Approved Arrangement.
4. The corrective action must be recorded, its effectiveness verified and the verification recorded.

Immediate Corrective Action

1. All defects shall be trimmed immediately.
2. Where zero tolerance is identified, part of the corrective action shall include all available offal in the room associated with the finished product type is to be re-inspected. Any defects identified are to be trimmed.
3. If no defects according to the classification in Table 5 are found, no further action is required.
4. If one or more defects according to the classification in Table 5 are found, the offending product (back to the last clear check) is subjected to re-inspection.
    - Assess the selected cartons on the basis of the classification in Table 5.
    - Any unacceptable cartons must be re-worked, that is, impose an additional trim on the unacceptable offal, and re-inspected until all affected product is rendered acceptable and fit for human consumption.

Examples and Case Studies

How to calculate a Defect Rating

Here is an example of a carcase defect score sheet.

Defect criterion	Number of Detections
Contamination	3
Pathology	1
Total number of Defects	3+1=4
Number of checks	50

The Defect Rating is the total number of contamination and pathology defects divided by the number of checks = (3+1) / 50 = 0.08.

If a ZT had been detected, then no Defect Rating needs to be calculated as the lot is automatically deemed Unacceptable.

How to calculate prevalence for Low- and High-risk products

1. Based on historical data, calculate the number of checks, the number of contamination defects and the number of pathology defects for each product type.
2. Divide the total number of contamination and pathology defects by the number of checks to give a prevalence.

As an example, the offal results for one establishment from the trial were:

Offal Type	Number of checks	Contamination defects	Pathology	Total	Prevalence
Heart	6140	0	0	0	0%
Kidney	3620	0	0	0	0%
Liver	6160	0	1	1	0.02%
Spleen	10	0	0	0	0%
Tripe	6090	20	0	20	0.33%
Lips	5982	0	0	0	0%

Based on these results and other considerations, the establishment might decide to classify as High-risk, all products with a prevalence > 0% (at least on defect detection) or only Tripe as it had defects detected repeatedly, even though the prevalence is quite low. They might also decide to classify only Lips as High-risk as these are head offal items and for this establishment, potentially pose a greater risk with their customers.

How to use the CMA Form for High-risk products

Consider an establishment producing lamb shanks (a High-risk product for the establishment). Therefore, lamb shanks are monitored (separately from other high-risk products) every 60 minutes of their production.

Below is an example of the inspection form completed for 4 & 5 February.

The first detection of a defect (at 12:21) does not result in corrective action as no defect had been detected in the previous cartons of lamb shanks checked during the shift. However, a second defect is detected at 14:51 at which point, corrective action is required as there are now two defects detected during the shift.

No defects are detected and recorded on 5 February.

Date	Time	Number of defects	Defect Description / Corrective Action
4 Feb	06:05	0	
	07:05	0	
	08:05	0	
	09:20	0	Includes 15 minute work break
	10:22	0	
	11:20	0	
	12:21	1	Hide fragment, 1.5cm GD
	13:47	0	Includes 30 minute work break
	14:51	1	16 wool strands – 2 defects during the shift **Corrective action required.**
	15:50	0	
5 Feb	06:10	0	
	07:08	0	
	08:13	0	
	09:09	0	Includes 15 minute work break
	10:24	0	
	11:18	0	
	12:22	0	
	13:51	0	Includes 30 minute work break
	14:48	0	
	15:45	0	

Appendix 1 – Carcase form

Establishment: _____

Date: _____

Shift: _____

Record all defects for each carcase/side sampled in a separate row.

The process is rated

- **Acceptable** if the calculated defect rating (total number of defects / the number of samples) is less than or equal to 0.25.
- **Unacceptable** if
  - One or more ZT defects are detected on any one carcase/side.
  - The calculated defect rating (total number of detects / the number of samples) is greater than 0.25.

Time	Species	Number of defects	Defect Description / Corrective Action

Total number of samples: _____

Defect Rating = Total number of defects ÷ Total number of samples =

QC Officer Name: _____

QC Officer Signature: _____

Appendix 2 – CMA form – High-risk products

Establishment: _____

Date: _____

Shift: _____

High-risk CMA product: _____

Record each separate carton sampled in a separate row.

The process is rated

- **Acceptable** if at most 1 non zero-tolerance defect is detected over all the sampled cartons during a shift.
- **Unacceptable** if
  - One or more ZT defects are detected in any one carton
  - More than one non-ZT defects are detected over all the sampled cartons during a shift
  - More than one non-ZT defects are detected in any single carton

Time	Number of defects	Defect Description / Corrective Action

QC Officer Name: _____

QC Officer Signature: _____

Appendix 3 – CMA form – Low-risk products

Establishment: _____

Date: _____

Shift: _____

Record each separate carton sampled in a separate row.

The process is rated

- **Acceptable** if at most 1 non zero-tolerance defect is detected in over all the sampled cartons during a shift.
- **Unacceptable** if
  - One or more ZT defects are detected in any one carton
  - More than one non-ZT defects are detected in any single carton
  - More than one non-ZT defects are detected over all the sampled cartons during a shift

Date	Time	Product Type	Number of defects	Defect Description / Corrective Action

QC Officer Name: _____

QC Officer Signature: _____

Appendix 4 – Offal form – High-risk products

Establishment: _____

Date: _____

Shift: _____

High-risk offal product: _____

Record each piece of offal sampled in a separate row.

The process is rated

- **Acceptable** if the calculated defect rating (total number of defects / the number of samples) is less than or equal to 0.084.
- **Unacceptable** if
  - One or more ZT defects are detected in any one piece of offal
  - The calculated defect rating (total number of detects / the number of samples) is greater than 0.084.

Time	Number of defects	Defect Description / Corrective Action

Total number of samples: _____

Defect Rating = Total number of defects ÷ Total number of samples =

QC Officer Name: _____

QC Officer Signature: _____

Appendix 5 – Offal form – Low-risk products

Establishment: _____

Date: _____

Shift: _____

Record each piece of offal sampled in a separate row.

The process is rated

- **Acceptable** if the calculated defect rating (total number of defects / the number of samples) is less than or equal to 0.084.
- **Unacceptable** if
  - One or more ZT defects are detected in any one piece of offal
  - The calculated defect rating (total number of detects / the number of samples) is greater than 0.084.

Time	Product Type	Number of defects	Defect Description / Corrective Action

Total number of samples: _____

Defect Rating = Total number of defects ÷ Total number of samples =

QC Officer Name: _____

QC Officer Signature: _____

8.2 Appendix 2: MHA 3 monitoring data sets for establishments A-L

Establishment A

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	5,283	1	15	9	27	17	8	0	0
Pre-Trim BR	4,870	2	4	62	115	11	14	0	1
CMA – High-Risk	1,187	0	1	2	0	0	2	0	0
CMA – Low-Risk	1,169	0	0	1	0	0	2	0	0
Offal – High-Risk	9,549	0	NA	0	21	7	1	0	2
Offal – Low-Risk	2,712	0	NA	0	0	0	0	0	0

Establishment B

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	4,288	0	1	0	43	18	2	0	0
Pre-Trim BR	4,020	0	0	0	18	7	2	0	0
CMA – High-Risk	4,662	1	2	0	21	0	2	0	0
CMA – Low-Risk	1,205	0	0	0	0	0	0	0	0
Offal – High-Risk	10,332	1	NA	0	45	16	1	0	0
Offal – Low-Risk	2,695	0	NA	0	0	0	0	1	0

Establishment C

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	6,100	1	40	25	77	16	2	1	0
Pre-Trim BR	7,410	0	138	26	13	1	6	5	5
CMA – High-Risk	3,156	2	352	2	87	0	21	20	84
CMA – Low-Risk	1,664	0	60	0	1	0	3	2	9
Offal – High-Risk	10,164	0	NA	0	0	0	0	0	0
Offal – Low-Risk	1,462	0	NA	0	0	0	0	0	0

Establishment D

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	18,388	4	5	7	193	12	0	1	0
Pre-Trim BR	19,840	2	15	3	65	6	0	4	1
CMA – High-Risk	3,347	0	0	0	2	2	0	0	0
CMA – Low-Risk	8,065	0	0	0	0	0	0	0	0
Offal – High-Risk	26,550	2	NA	0	382	0	0	0	*12
Offal – Low-Risk	85,570	2	NA	0	29	3	4	0	0

*partially simulated from MHA 2 data

Establishment E

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	8,774	0	2	30	487	10	0	104	2
Pre-Trim BR	8,950	0	0	1	36	9	0	0	4
CMA – High-Risk	10,774	0	0	0	0	0	0	2	0
CMA – Low-Risk	29,851	0	0	0	2	0	0	0	0
Offal – High-Risk	9,260	0	NA	0	49	6	6	0	*2
Offal – Low-Risk	33,020	0	NA	1	13	1	2	7	0

*partially simulated from MHA 2 data

Establishment F

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	6,626	2	2	4	49	18	0	0	0
Pre-Trim BR	2,852	2	0	35	13	14	4	0	2
CMA – High-Risk	1,887	0	0	0	0	0	0	0	0
CMA – Low-Risk	1,034	0	0	0	0	0	0	0	0
Offal – High-Risk	8,466	9	NA	1	6	5	6	0	1
Offal – Low-Risk	1,484	4	NA	0	1	1	2	0	0

Establishment G

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	18,400	7	345	13	71	239	0	10	1
Pre-Trim BR	7,648	1	13	1	2	2	0	0	0
CMA – High-Risk	9,083	22	0	0	0	0	0	0	7
CMA – Low-Risk	4,143	0	0	0	0	0	0	0	0
Offal – High-Risk	6,576	0	NA	0	0	0	0	4	1
Offal – Low-Risk	4,392	0	NA	0	0	0	0	0	0

Establishment H

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	78,579	1	1,823	563	134	1,500	259	35	0
Pre-Trim BR	10,034	2	139	65	11	69	6	1	0
CMA – High-Risk	5,854	0	73	41	1	80	8	13	30
CMA – Low-Risk	2,834	0	35	18	0	5	3	2	11
Offal – High-Risk	69,912	0	NA	0	0	1	33	63	0
Offal – Low-Risk	10,212	0	NA	0	0	0	4	0	0

Establishment J

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	20,613	0	22	93	188	513	4	9	0
Pre-Trim BR	3,803	0	18	49	39	96	3	2	2
CMA – High-Risk	1,182	0	0	0	0	3	0	1	1
CMA – Low-Risk	1,108	0	0	5	3	3	0	2	2
Offal – High-Risk	-	-	-	-	-	-	-	-	-
Offal – Low-Risk	1,596	0	NA	0	0	1	0	1	0

Establishment K

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	6,350	6	48	30	37	232	3	11	0
Pre-Trim BR	3,860	3	17	9	31	127	24	23	4
CMA – High-Risk	6,636	1	7	2	162	1	17	17	7
CMA – Low-Risk	1,213	0	0	0	16	0	5	3	1
Offal – High-Risk	10,244	1	NA	1	4	15	4	31	2
Offal – Low-Risk	5,152	0	NA	0	0	7	1	1	0

Establishment L

Category	n	ZT	Rail Dust / Specks	Smears / Stains	Strands	Clusters	Foreign Objects	Pathology	Limit Exceeded
Carcase	5,492	0	223	67	265	377	30	0	2
Pre-Trim BR	3,190	0	85	63	239	179	13	0	91
CMA – High-Risk	1,540	0	34	11	79	204	4	0	50
CMA – Low-Risk	851	0	0	0	8	3	0	0	1
Offal – High-Risk	5,176	0	NA	4	47	66	19	0	13
Offal – Low-Risk	1,285	2	NA	0	0	0	43	0	6